

## A Performance Comparison of N-type TOPCon and PERC Bifacial in Hainan

The solar power system on which the investigations were carried out is located in Hainan (18°10'-20°18 N,108°37'-111°03' E).

Its installed capacity equals 4.5 KWp (based on the front side rating power) consisting of 10 panels for each type (PERC mono, PERC bifacial and N-type TOPCon). The system is grid connected. Considering the geographical location of the facility, the installed modules are inclined in an angel of 34° from the horizontal plane facing south. All types of modules are placed vertically and string connected. The modules are installed 0.5 m above the cement ground in order to ensure good rear side generation.



Figure 1.The location information of Hainan

The modules are connected to the grid using an Huawei SUN2000-60KTL-M0 inverter with nominal apparent AC power of 60 kW, characterized by the maximum efficiency of 98.6%, operating temperature range from 25°C to 60°C and maximum input voltage of 1100 V.

Within the area of the PV plant, no partial shadowing or lowering of the module output was recorded but the modules were left uncleaned. All the installed modules were new and the experimental system started to operate since February, 2021.



Figure 2. The project picture

The DC and AC electric power registered by inverters as well as solar irradiance and module temperature measurements were recorded every 5 minutes by the central data logging computer to achieve synchronous data collection.

## **Solar Irradiation Data**

The solar plant under investigation is located in the tropical island climate which is characterized by significant hot and humidity throughout the whole year. Among many climate elements, solar irradiation is the most important factor determining the performance of the pv plant. According to the prior measurements at the studied location, the irradiance is in the range of 0-1400 W/m<sup>2</sup>.

## Result and conclusion:

On a sunny day, from 7:00am to 5:00pm, generation gain of N-type TOPCon module has an average of 3.46% over PERC bifacial module, and particularly 5.85% gain in the time 7:00-8:00am.



Figure 3. Daily energy yield on a sunny day in Hainan project

On a cloudy day, monitored from 7:00am to 5:00pm, generation gain of N-type TOPCon module has an average of 4.56% over PERC bifacial module, including 6.05% and 10.26% more electricity yield during the time from 7:00 am to 8:00 am and from 16:00 pm to 17:00 pm respectively. The distinguished difference for cloudy condition between two type of modules have benifited from the superior temperature coeffient and better low-light performance of N-type TOPCon module in comparison to PERC.



00-8:00 8:00-9:00 9:00-10:00 10:00-11:00 11:00-12:00 12:00-13:00 13:00-14:00 14:00-15:00 15:00-16:00 16:00-17:00

Figure 4. Daily energy yield on a cloudy day in Hainan project